Check List 8(2): 207-210, 2012
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ISSN 1809-127X (available at *www.checklist.org.br*)

Check List
Journal of species lists and distribution

LISTS OF SPECIES

Amphibians and Reptiles from Paramakatoi and Kato, Guyana

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ABSTRACT: We report the herpetofauna of two neighboring upland locations in west-central Guyana. Twenty amphibian and 24 reptile species were collected. Only 40% of amphibians and 12.5% of reptiles were collected in both locations. This is one of the few collections made at upland (750–800 m) locations in the Guiana Shield.

INTRODUCTION

The Guiana Shield region of northeastern South America is one of the world's areas of greatest biodiversity. The herpetofauna of the region remains poorly documented, although there have been several general publications on the subject (Starace 1998; Gorzula and Señaris 1999; Lescure and Marty 2000; Reynolds *et al.* 2001; Avila-Pires 2005; McDiarmid and Donnelly 2005; Señaris and MacCulloch 2005).

In Guyana, the herpetofaunas of some localities have been documented by Donnelly *et al.* (2005), Ernst *et al.* (2005), MacCulloch *et al.* (2007), Kok and Kalamandeen (2008), MacCulloch and Lathrop (2009) and Reynolds and MacCulloch (2012). These localities are at either low (<500 m) or high elevations (>1400 m), and faunal descriptions from intermediate-elevation upland localities are lacking. This paper reports on the herpetofaunas of two such upland locations in Guyana.

MATERIALS AND METHODS

Study area

Paramakatoi and Kato are in the southern foothills of the Pakaraima Mountains in west-central Guyana (Figure 1). Paramakatoi (04°41'50" N, 59°47'12" W, elevation 800 m, Figure 2) is a village of the Patamona people. Vegetation in the area varies from lower montane sclerophyllous forest to scrub savanna (Huber *et al*. 1995). Extensive clearing of forest for agriculture, principally cassava (*Manihot esculenta*), has occurred in the vicinity of the village. Undisturbed forest is patchy, and regenerated low-canopy forest is common around the village. Several streams and artificial ponds are in the area.

Kato (04°40' N, 59°49' W, elevation 760 m) is another Patamona Amerindian village located some 20 km southwest of Paramakatoi along a trail connecting the two villages. The countryside around Kato is primarily broad, gently-rolling, mid-elevation savanna with scattered small trees (e.g. *Plumeria*), shrubs (e.g. *Bysonima*), and palm stands (*Maurita flexuosa*) (Hollowell et al. 2003). Immediately west of Kato is the nearby Chiung River, a rocky-bottomed watercourse about 50 m wide with numerous small falls and a distinct riparian zone. Many small agricultural clearings, in typical rotating "slash and burn" fashion, are common around Kato in the areas where savanna transitions to forest. The principal cultivated crops were cassava, corn (*Zea mays*), and bananas (*Musa* sp.).

Specimen Collection

Field work was conducted during the dry season in both 1989 and in 1996. Collecting at Paramakatoi took place between 11–13 March 1989 (RPR) and 14–30 April 1996 (RDM). Collections were made at Kato between 15–20 March 1989 by RPR. Specimens were collected and exported under permit number 02753 issued by the Wildlife Services Division, Guyana Ministry of Agriculture.

At Paramakatoi the majority of collections were made within a few km of the village. Most specimens were captured by hand, although some were collected in an array of 12 pitfall traps, with connecting drift fence, in a savanna area.

Likewise, at Kato most collections were made within a few km of the village. All specimens were hand captured; amphibians primarily at night in the riparian vegetation along the Chiung River, and reptiles during the day from the savanna scrub vegetation and rocky hillsides along the river.

Specimens were euthanized using approved methods recommended by the American Society of Ichthyologists and Herpetologists, the Herpetologists' League, and the Society for the Study of Amphibians and Reptiles (Simmons 2002), and preserved in 10% formalin. Tissue was removed from most specimens. Specimens are deposited in the collections of the Royal Ontario Museum (ROM) and Smithsonian Institution's National Museum of Natural History (USNM).

Amphibian taxonomy follows Frost (2011). Reptile taxonomy follows Avila-Pires (2005), with modifications by Frost *et al.* (2001), Gamble *et al.* (2008), Adalsteinsson *et al.* (2009) and Zaher *et al.* (2009).

Results and Discussion

Our surveys of the herpetofauna at Paramakatoi and Kato produced anurans, lizards, snakes, and turtles. Caecilians, crocodylians, and amphisbaenians were not recorded but are expected to be present. Salamanders do not occur in the Guiana Shield.

At Paramakatoi, amphibians were collected in greater numbers than reptiles, although reptile diversity was higher (18 amphibian species in eight families vs. 20 reptile species in 13 families).

Figure 1. Map of Guyana showing the locations of Paramakatoi (P) and Kato (K).

Figure 2. The foothills of the Pakaraima Mountains at Paramakatoi.

The streams, ponds and their riparian vegetation were the preferred habitat for most amphibian species. The majority of our *Rhinella marina*, *Stefania woodleyi, Dendropsophus minutus*, *Hypsiboas* aff. *crepitans*, *H. geographicus*, *H. multifasciatus*, *Phyllomedusa bicolor*, *Physalaemus cuvieri, Pipa arrabali*, *Lithobates palmipes* and an undescribed *Allobates* were collected in these habitats. *Ameiva ameiva* and *Kentropyx striata* were found in savanna, cleared areas and in the vicinity of dwellings; these two species were the only taxa collected in the pitfall traps. Other taxa were collected in forested habitat or at the forest edge. Larvae and metamorphs of *Rhinella marina*, *R. merianae*, *Hypsiboas cinerascens, H.* aff. *crepitans, H. geographicus*, *H. multifasciatus*, *Osteocephalus taurinus* and *Lithobates palmipes,* neonates of *Pipa arrabali* and eggs of *Ameiva ameiva* were collected.

At Kato, slightly more amphibian species were collected than reptile species (10 anuran species in four families vs. eight reptile species in seven families). Conditions were very dry during this period and all amphibians were collected in the grasses, sedges, and trees along the rocky shores of the Chiung River. Amphibian larvae were collected from shallow rock-bottomed pools at the river's edge. *Anolis auratus*, *Ameiva ameiva*, *Cnemidophorus lemniscatus*, *Tropidurus hispidus*, *Spilotes pullatus* and *Crotalus durissus* were collected in savanna and rocky hillsides above the river, whereas *Liophis typhlus* was found in secondary forest at the savanna edge. *Phrynops tuberosus* were found in a small sedge-filled, spring-fed pool near the village, and represent the first unequivocal records of this species for Guyana (Reynolds 1990).

Species collected, location and specimen numbers are in Table 1. Photographs of some species are in Figure 3.

Eight anuran species (*Rhinella marina, R. merianae, Hypsiboas boans, H.* aff. *crepitans, H. geographicus, H. multifasciatus, Leptodactylus longirostris, Lithobates palmipes*) and three reptile species (*Anolis auratus, Ameiva ameiva, Liophis typhlus*) were collected at both Paramakatoi and Kato. Ten anuran species (*Allobates* sp., *Stefania woodleyi, Dendropsophus minutus, Hypsiboas cinerascens, H. sibleszi, Osteocephalus taurinus, Phyllomedusa bicolor, Leptodactylus knudseni, Physalaemus cuvieri, Pipa arrabali*) were collected only at Paramakatoi while two (*Rhaebo guttatus, Leptodactylus hylaedactylus*) were collected only at Kato.

Sixteen species of reptiles (*Cercosaura ocellata, Anolis punctatus, Mabuya nigropunctata, Kentropyx striata, Plica umbra, Chironius scurrulus, Oxybelis aeneus, Dipsas variegata, Liophis cobella, Sibon nebulata, Micrurus psyches, Tricheilostoma macrolepis, Typhlops reticulatus, Bothropsis bilineata, Lachesis muta, Geochelone carbonaria*) were collected only at Paramakatoi; five species (*Cnemidophorus lemniscatus, Tropidurus hispidus, Spilotes pullatus, Crotalus durissus, Phrynops tuberosus*) were collected only at Kato. The overlap in amphibian species collected at the two locations is 40%, in reptiles 12.5%.

Almost all of the species collected are taxa that normally occur at low elevations. The only species that has been collected frequently in highland locations is *Hypsiboas sibleszi* (Gorzula and Señaris 1999; McDiarmid and Donnelly 2005; MacCulloch *et al*. 2007; MacCulloch and Lathrop 2009), and only one specimen of this species was collected. From our results, it appears that upland herpetofaunal communities consist principally of low-elevation species, and that high-elevation taxa seldom occur in upland locations. This hypothesis should be tested in other upland locations, especially in undisturbed habitat.

Faunal lists exist for a few other locations in Guyana. At Kaieteur National Park, 45 anuran species were reported (Kok and Kalamandeen 2008). At Mabura Hill Forest

Table 1. Amphibians and reptiles collected at Paramakatoi (P) and Kato (K).

FAMILY	SPECIES	LOCALITY	INSTITUTIONAL CATALOGUE NUMBERS
AMPHIBIA			
Aromobatidae	*Allobates* sp.	P	ROM 38224
Bufonidae	*Rhaebo guttatus*	K	USNM 291102–3
	Rhinella marina	P, K	ROM 28399–403; USNM 291104, 291157–9, 291271
	Rhinella merianae	P, K	USNM 291085–101, 291269–70
Hemiphractidae	*Stefania woodleyi*	P	ROM 28425; USNM 561836
Hylidae	*Dendropsophus minutus*	P	USNM 291171–2
	Hypsiboas boans	P, K	ROM 28420–1; USNM 291105, 291160, 291273
	Hypsiboas cinerascens	P	USNM 291272, 291280
	Hypsiboas aff. *crepitans*	P, K	ROM 28433, 28436–8; USNM 291106–13, 291161–8, 291279
	Hypsiboas geographicus	P, K	ROM 28427–32, 28439–49; USNM 291114, 291169–70
	Hypsiboas multifasciatus	P, K	ROM 28434–5; USNM 291115–21, 291173–6
	Hypsiboas sibleszi	P	ROM 28450
	Osteocephalus taurinus	P	USNM 291274–5
	Phyllomedusa bicolor	P	ROM 28419
Leiuperidae	*Physalaemus cuvieri*	P	USNM 291178–83
Leptodactylidae	*Leptodactylus hylaedactylus*	K	USNM 291122
	Leptodactylus knudseni	P	ROM 28451–2
	Leptodactylus longirostris	P, K	USNM 291123–6, 291177
Pipidae	*Pipa arrabali*	P	ROM 28379–98; USNM 291184
Ranidae	*Lithobates palmipes*	P, K	ROM 28836–970; USNM 291127–30, 291276–8
REPTILIA			
Gymnophthalmidae	*Cercosaura ocellata*	P	ROM 28352
Polychrotidae	*Anolis auratus*	P, K	USNM 291131, 291185
	Anolis punctatus	P	ROM 28351
Scincidae	*Mabuya nigropunctata*	P	ROM 28349
Teiidae	*Ameiva ameiva*	P, K	ROM 28358–66; USNM 291138, 291186–90, 291281
	Cnemidophorus lemniscatus	K	USNM 291139–50
	Kentropyx striata	P	ROM 28353–7
Tropiduridae	*Plica umbra*	P	ROM 28350
	Tropidurus hispidus	K	USNM 291132–7
Colubridae	*Chironius scurrulus*	P	ROM 28376–7
	Oxybelis aeneus	P	ROM 28374
	Spilotes pullatus	K	USNM 291152
Dipsadidae	*Dipsas variegata*	P	ROM 28371
	Liophis cobella	P	ROM 28372
	Liophis typhlus	P, K	ROM 28375; USNM 291151
	Sibon nebulata	P	ROM 28373
Elapidae	*Micrurus psyches*	P	ROM 28378
Leptotyphlopidae	*Tricheilostoma macrolepis*	P	ROM 28367; USNM 291191
Typhlopidae	*Typhlops reticulatus*	P	ROM 28368
Viperidae	*Bothropsis bilineata*	P	ROM 28369–70
	Crotalus durissus	K	USNM 291153
	Lachesis muta	P	USNM 291192
Chelidae	*Phrynops tuberosus*	K	USNM 291154–6
Testudinidae	*Chelonoidis carbonaria*	P	USNM 291193

Reserve, 41 anuran species were found (Ernst *et al.* 2005). At Iwokrama Forest, 47 anurans, 64 squamates and seven turtles were reported (Donnelly *et al.* 2005). At Baramita in northwestern Guyana, 25 anurans, 27 squamates and one turtle species were collected (Reynolds and MacCulloch 2012). At Paramakatoi and Kato 20 anurans, 22 squamates and two turtle species were found. The lower diversity at Paramakatoi and Kato could be accounted for by differences in habitat quality, sampling effort, and sampling during the dry season. Kaieteur, Mabura and Iwokrama are natural reserves, with minimal habitat disturbance, and sampling in these locations occurred over much longer time periods than at Paramakatoi and Kato, and encompassed both wet and dry seasons.

Despite the disturbed habitat at Paramakatoi and Kato, we feel that the species lists serve to document the composition of herpetofaunas in areas that are affected by human activity. Furthermore, herpetofaunal inventories of intermediate-elevation upland areas such as Paramakatoi and Kato are lacking.

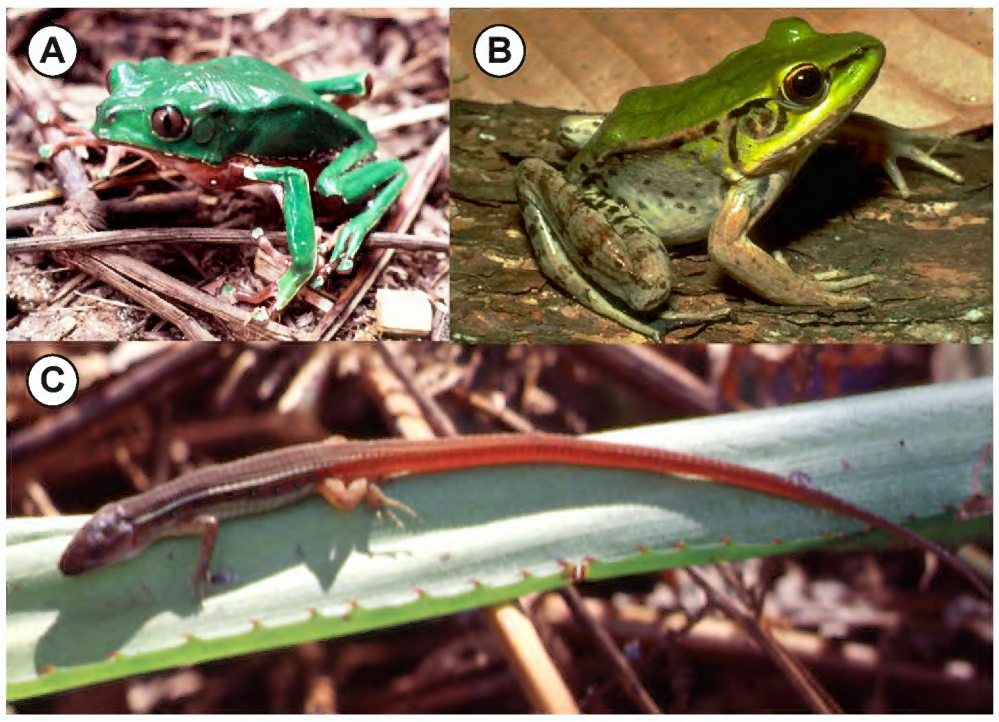

Figure 3. A. *Phyllomedusa bicolor.* B. *Lithobates palmipes.* C. *Cercosaura ocellata.*

Acknowledgments: K. Coates, D. Stacey and J. Locke were supportive field companions. The Biodiversity of the Guiana Shield (BDG) Program, especially V. Funk, C. Kelloff, W. Hahn and D. Clarke, provided logistic support. RPRs 1989 travel between Georgetown and Paramakatoi and Kato was provided by a joint medical operation of the Guyana Ministry of Health, the Guyana Defense Force, and the United States Army. RDMs 1996 travel between Georgetown and Paramakatoi was coordinated by M. and M. Chan-A-Sue. Captain G. John and the residents of Paramakatoi offered their hospitality and collected several specimens. Fieldwork by RDM was funded by the ROM Governors and ROM Department of Natural History. Fieldwork by RPR was supported by the Biodiversity of the Guiana Shield Program. An earlier version of the ms was reviewed by C.L. Barrio-Amorós and S.W. Gotte. This is contribution number 347 of the Centre for Biodiversity and Conservation Biology, ROM and number 183 in the Smithsonian's Biological Diversity of the Guiana Shield Program publication series.

Literature Cited

Adalsteinsson, S.A., W.R. Branch, S. Trape, L.J. Vitt and S.B. Hedges. 2009. Molecular phylogeny, classification, and biogeography of snakes of the family Leptotyphlopidae (Reptilia, Squamata). *Zootaxa* 2244: 1–50.

Avila-Pires, T.C.S. 2005. Reptiles; p. 25–40 *In* T. Hollowell and R.P. Reynolds (ed.). *Checklist of the terrestrial vertebrates of the Guiana Shield*. Bulletin of the Biological Society of Washington 13: 98 p.

Donnelly, M.A., M.H. Chen and G.G. Watkins. 2005. An exploration of diversity in a Guyanan rainforest; p. 428–460 *In* M.A. Donnelly, B.I. Crother, C. Guyer, M.H. Wake, and M.E. White (ed.). *Ecology and Evolution in the Tropics: a Herpetological Perspective*. University of Chicago Press.

Ernst, R., M.-O. Rödel and D. Arjoon. 2005. On the cutting edge – The anuran fauna of the Mabura Hill Forest Reserve, central Guyana. *Salamandra* 41(4): 179–194.

Frost, D.R. 2011. *Amphibian Species of the World: an Online Reference. Version 5.5* Electronic Database accessible at http://research.amnh.org/vz/herpetology/amphibia/ American Museum of Natural History, New York, USA. Captured on 11 January 2012.

Frost, D.R., M.T. Rodrigues, T. Grant and T. Titus. 2001. Phylogenetics of the lizard genus *Tropidurus* (Squamata: Tropiduridae: Tropidurinae): direct optimization, descriptive efficiency, and sensitivity analysis of congruence between molecular data and morphology. *Molecular Phylogenetics and Evolution* 21(3): 352–371.

Gamble, T., A.M. Bauer, E. Greenbaum and T.R. Jackman. 2008. Evidence for Gondwanan vicariance in an ancient clade of gecko lizards. *Journal of Biogeography* 35(1): 88–104.

Gorzula, S. and J.C. Señaris. "1998" [1999]. Contribution to the herpetofauna of the Venezuelan Guayana I. A data base. *Scientia Guaianae* No. 8, Caracas, xviii–269.

Hollowell, T., L.J. Gillespie, V.A. Funk, and C.L. Kelloff. 2003. Smithsonian Plant Collections, Guyana: 1989-1991, Lynn J. Gillespie. *Contributions from the United States National Herbarium* 44: 1–104.

Huber, O., G. Gharbarran and V. Funk. 1995. *Vegetation map of Guyana*. Georgetown: Centre for the Study of Biological Diversity, University of Guyana.

Kok, P.J.R. and M. Kalamandeen. 2008. Introduction to the taxonomy of the amphibians of Kaieteur National Park, Guyana. *Abc Taxa* 5: 1–278.

Lescure, J. and C. Marty. 2000. Atlas des amphibiens de Guyane. *Patrimoines Naturels* 45: 1–388.

MacCulloch, R.D. and A. Lathrop. 2009. Herpetofauna of Mount Ayanganna, Guyana: Results of the Royal Ontario Museum Ayanganna Expedition 2000. *Contributions in Science, Royal Ontario Museum* 4: 1–35.

MacCulloch, R.D., A. Lathrop, R.P. Reynolds, J.C. Señaris and G.E. Schneider. 2007. Herpetofauna of Mount Roraima, Guiana Shield region, northeastern South America. *Herpetological Review* 38: 24–30.

McDiarmid, R.W. and M.A. Donnelly. 2005. The herpetofauna of the Guayana Highlands: amphibians and reptiles of the Lost World; p. 461–560 *In* M.A. Donnelly, B.I. Crother, C. Guyer, M.H. Wake and M.E. White (ed.). *Ecology and evolution in the tropics: a herpetological perspective.* Chicago: University of Chicago Press.

Reynolds, R.P. 1990. Geographic distribution: *Phrynops geoffroanus tuberosus* (Geoffroy's Sideneck Turtle). *Herpetological Review* 21: 40.

Reynolds, R.P. and R.D. MacCulloch. 2012. Preliminary checklist of amphibians and reptiles from Baramita, Guyana. *Check List* 8(2): 211-214.

Reynolds, R., R.D. MacCulloch, M. Tamessar and C. Watson. 2001. *Checklist of the herpetofauna of Guyana.* Accessible at http://www.mnh.si.edu/biodiversity/bdg. Captured on 20 December 2011.

Señaris, J.C. and R. MacCulloch. 2005. Amphibians; p. 9–23. *In* T. Hollowell and R.P. Reynolds (ed.). *Checklist of the terrestrial vertebrates of the Guiana Shield*. Bulletin of the Biological Society of Washington 13: 98 pp.

Simmons, J. 2002. Herpetological collecting and collections management. *Herpetological Circulars* 31: 1–153.

Starace, F. 1998. *Guide des serpents et amphisbènes de Guyane.* Guadeloupe: Éditions Ibis Rouge. 449 p.

Zaher, H., F.G. Grazziotin, J.E. Cadle, R.W. Murphy, J.C. Moura-Leite and S.L. Bonatto. 2009. Molecular phylogeny of advanced snakes (Serpentes, Caenophidia) with an emphasis on South American Xenodontines: a revised classification and descriptions of new taxa. *Papéis Avulsos de Zoologia* 49(11): 115–153.

Received: January 2012
Accepted: March 2012
Published online: May 2012
Editorial responsibility: Philippe J.R. Kok